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SUBJECT INDEXING MYTHOLOGY*

by

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When Dr. Artandi of Rutgers, invited me to prepare a paper on some aspect of Alphabetic Subject Indexing, I thought she must be clairvoyant for how else would she know that at this particular point in time, this subject is of vital interest to the staff of the National Agricultural Library. You may or may not know that Congress gave us money in our 1964 appropriation to plan for a desperately needed new building for the National Agricultural Library. What does this have to do with the subject? A great many things, based on a great many "ifs."

If we get our new building, we shall probably retain a branch library in our present location since the new building will be on the grounds of the Agricultural Research Center, at Beltsville, Maryland. In this branch, we shall need a complete catalog of the collection and at present we have only a single alphabetical dictionary catalog on cards. We are exploring how we can feasibly publish our catalog - not only for the proposed branch, but also for the benefit of our field libraries and the land-grant university and other agriculture oriented libraries spread across the country. At the same time, we are seeking the best method to keep all of these libraries informed currently of the titles newly cataloged for the collection. If the publication of our catalog becomes a reality, and if we get our new building, exciting and challenging opportunities open up before us - opportunities which come but rarely to a library over 100 years old. We are presented with the opportunity to begin a new card catalog which can be an alphabetical, traditional classified, or a faceted classified catalog. We have the opportunity, the challenge and the obligation to consider such things as: how automation can help us; whether we should change our scheme for shelving publications; whether we should retain a permanently growing card catalog or one that is replaced by printed catalogs; how the printed catalogs should be arranged and their relationship to our bibliographic index, the Bibliography of Agriculture. If we get our money and therefore our new building, and if we establish a publishing program to spread the results of our cataloging efforts, we no longer have to be bound to tradition. We can close off or dispose of our old card catalog. We can close off our old collection and begin arranging our new publications in some different way. We are faced with Decisions, Decisions, and more Decisions. All I hope is that Providence is on our side, and that we have the good judgment to make

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the proper decisions to serve the needs of our international clientele.

Thus, we have begun to investigate - to read, to study, to listen, and to discuss - all from the viewpoint of a highly specialized national research library; a library which holds well over a million volumes, and in which our subject "Agriculture" is interpreted in its broadest sense to include not only technical agriculture but also such fields as Botany, Zoology, Forestry, Agricultural Economics, Rural Sociology, Home Economics and so on. Final decisions have not been reached, but the reading, studying, listening and discussion have led me to think about the myths which have developed about subject indexing, regardless of whether that indexing is done for card catalogs, printed bibliographies, or for tape, drum or disc bibliographies. The myths are not confined to alphabetic subject indexing, so I shall go a little further afield than alphabetic subject indexing.

It is no myth that scientific publication has grown by leaps and bounds since World War II, and that improvement in handling of scientific and technical information is of vital importance. As the Director of our Library, Foster E. Mohrhardt, has stated:

> "Inadequate access to scientific information is the friction that impedes, complicates and leads to duplication in scientific research and development."[1]

This is a matter of deep concern at the highest governmental level as evidenced by the President's Science Advisory Committee in its report on Science, Government, and Information, familiarly known as the "Weinberg Report."[2] The actions of its Committee on Scientific Information provide further evidence, going all the way from requesting a focal point for scientific information in each executive agency of the government to standardizing microforms produced by government offices. The myths appear in some of the ideas, plans and methods proposed or developed to improve the handling of scientific and technical information.

Problems Solved

First and foremost, I place the myth that the problems presented by alphabetic subject indexing have now been solved by other methods of indexing. Our latter-day saints in the indexing world, those such as Taube with his coordinate indexing, Ranganathan with his colon classification, Coates with his chain indexing, and Shera with his exhaustive and specific indexing, would have us believe that their solutions are superior to the direct alphabetic subject approach. These solutions, mind you, require an alphabetic approach of some kind in order to use the solution. Even coordinate indexing has had to turn to the use of the alphabet. The general theme seems to be that alphabetic subject arrangements are illogical and dispersive and that classification and/or coordination of terms retrieve more efficiently

the literature of a subject. Classification advocates argue that ideas which cannot be expressed in ordinary language, can be better expressed through classification symbols - of course, words are needed to explain these symbols. The need for expressing new concepts, the difficulties of setting up new subject headings, or changing old ones, the order of words used in phrase headings, the form of phrase headings, and the use of subdivisions are all pointed to as valid reasons for abandoning alphabetic subject headings. Yet, it still remains to be proven that any of the new systems meet the needs of a large collection as well as, or any better than, alphabetic subject headings. In fact, just the opposite may have been proven by the ASLIB Cranfield Research Project. In their first comparative test of the efficiency of the Universal Decimal Classification, the alphabetic subject index, a special facet classification, and the Uniterm system of coordinate indexing, no appreciable differences in effectiveness of the systems were found.(3)

A new study to be watched is that of the University of Chicago. This is a project "to illustrate the use of a number of indexing systems on a common example of scientific documents. ₍It₎ is expected to provide insight into important characteristics of different systems for representing the subject content of scientific documents and to facilitate qualitative comparisons of them."(4)

Another common assumption is that an alphabetical approach is suitable for the non-research user, but a classified approach suits research needs better. The experience of our Pacific Southwest Forest and Range Experiment Station is pertinent to this. Their library departed from the normal alphabetic subject catalog used by our field libraries and adopted the Oxford system of classification for Forestry in order to provide bibliographic services in support of research without building up a large collection of publications. The Oxford system is a special expansion of the forestry number in the Universal Decimal Classification. The library subscribed to the Centralized Title Service of the Commonwealth Forestry Bureau. This service supplies a 3x5 inch card for every article scanned for possible inclusion in <u>Forestry Abstracts</u>. The cards, and there are a hugh number of them, are filed in a classified catalog which has syntactical signs. The librarian reports that the foresters at this station are not using the classified catalog.(5) This, in spite of efforts to promote the system. In order to encourage use of the classified catalog, the librarian is constructing an alphabetic key of American forestry terms to the Oxford system, similar to what has been done by the American Meteorological Society for <u>Meteorological and Geophysical Abstracts</u>. How successful this will be, we do not know.

Use studies of scientists' reading habits show that the scientist's approach to a catalog is ordinarily for a specific work. But as Carlyle Frarey pointed out in his work on <u>Subject Headings</u>(6), these studies have been concerned with questions of "how" and "how well" rather than with "why." They have given no significant information about the user's needs in consulting a catalog. The scientist does, however, use a subject approach

to consult other kinds of bibliographic tools. To say that he is helped
more by going to an alphabetic key to a classified bibliography before
he consults the bibliography, than by going direct to an alphabetically
arranged subject bibliography is making an assumption that I cannot accept.
It is evident, at least to me, that our old problems are still with us.

Automation

A great deal has already been written and said about how far we have
to go in developing systems and machinery in order to make automated
systems become economically feasible and useful tools for information
storage and retrieval. And yet the myth persists that libraries can be
fully and economically automated now. Hearing Don Swanson's speech at
last summer's conference of the University of Chicago Graduate Library
School and reading Gilbert King's report on automation of the Library of
Congress impressed me with their similar emphasis on the importance of
human beings and their different viewpoints on the uses of machines. Swanson
in discussing the user's approach to the catalog by means of a console,
pointed out that through the console, the user should be able to search the
collection for a specific work and for works on a subject, obtain printed
copies of journal articles from multiple titles and names of people who have
requested similar materials to enable personal contact, and be able to
browse through the collection. His speech made me long for the day this can
be true. He concluded that there is:

> "Need for new kinds of equipment more economically suited to
> an extraordinary high ratio of the amount of information stored
> to that processed."

and that:

> "Applications more complex than looking for a specific work are
> probably necessary in order to make automation economically
> attractive."

Finally he said:

> "Those operations within libraries which can be reduced to
> 'clerical' or 'formal' routines are susceptible of mechanization,
> while those which require professional training and hence the
> exercise of human judgment or intellect cannot be mechanized."(7)

The King report, reaches the following conclusions among others:

> "Automation of bibliographic processing, catalog searching, and
> document retrieval is technically and economically feasible in
> large research libraries."

It goes on to say:

> "The retrieval of the intellectual content of books by automatic methods is not now feasible for large collections, but progress in that direction will be advanced by effective automation of cataloging and indexing functions."

In elaborating on the first of these conclusions, King explains that:

> "At the outset only catalogs, inventory files and indexes should be considered for automation. Even here, to use these in a sophisticated manner, it may be necessary (and there should be no reluctance) to insert manual processing and human decisions when they are essential or too expensive to replace."(8)

Note that both King and Swanson call for human judgment or human decision, and that they both acknowledge that at this stage in the development of automated systems, indexing decisions cannot be taken over by machines. These decisions, regardless of the index method to which they are applied, alphabetic, classified or automated, are similarly fallible and similarly subject to human interpretation and to human error. Even so, human decision is one function which cannot be taken over by machines as developed up to now.

Note too, that where Swanson suggests that functions such as searching for a specific work is not a complex enough application to make automation economically attractive, King concludes that automation for bibliographic processing, catalog searching and document retrieval is economically feasible in large libraries. This is especially interesting since Swanson was a member of the Library of Congress survey team of which King was the Chairman.

Suffice it to say that we still have a mighty long way to go to automate subject indexing. Ralph Shaw summed up the automation situation neatly in _Science_ last spring when he wrote:

> "If computers can retrieve information more efficiently than it can be retrieved by other methods, we ought to be using them more widely. If they cannot, then in the interest of service to scholarship - whether in science or in other fields - we should stop making irresponsible claims for these systems, regardless of whether the claims are made by librarians, information officers, documentalists, government officials, administrators, engineers, scientists, or others."(9)

Depth Indexing

Now let us take a look at the myth of the high value of depth indexing. The first ASLIB Cranfield Research Project study to which I referred earlier, discovered that there was no appreciable difference in the retrieval or recall capabilities of the four systems studied. The results of the first test led to the next study by Cyril Cleverdon and his team - a study to determine not only recall of material, but relevance of the material recalled. It was felt that recall by itself was an inadequate measure of performance. This second study is pertinent to the myth of depth indexing. Only two systems were tested in this go-round, the manual facet catalog of the English Electric Company and Western Reserve University's Index to Metallurgical Literature. The Western Reserve system is a deep indexing system based on conventional abstracts, telegraphic abstracts and role indicators in which all terms are translated into code mechanically. The whole abstract with all of its characters and phrases is converted into the language of the computer. Each document selected for the experiment averaged $12^1/_2$ entries in the facet catalog; the Western Reserve system averaged 30 terms per document. In the latter, if the role indicators were counted as separate terms, the average number of entries would have been 60. The report on this test revealed that the Western Reserve system's "striving for perfection resulted in an operating performance which was no better than that of Cranfield's facet system, and an economic performance which, clearly, compared very badly." Jean Aitchison and Cyril Cleverdon went on to say:

> "Probably the most important factor in the present operating performance [of the Western Reserve system] is their level of exhaustivity of indexing."[10]

The authors conclude:

> "This test confirms the practically total lack of importance of the arrangement of terms in the index language. Many working in the field of information retrieval believe that a new classification, 'association of terms' or similar idea will be the philosopher's stone that will transform the dross of present techniques to the pure gold of perfect I.R. systems."[11]

Interestingly enough, from this study a clear picture of the inverse relation between the factors of recall and relevance was found. In their article about the study which appeared in the February 1964 issue of Special Libraries,[12] Cleverdon and his associates reported that once an optimum level of performance had been reached, any device added to the system to improve recall must inevitably reduce relevance; any device added to improve relevance must reduce recall. Key factors were found to be specificity and exhaustivity of indexing and searching. The research team stresses that specificity of the index language makes for higher

relevance and lower recall and specificity depends on the indexing vocabulary. They stress too that exhaustivity depends on decisions made by the indexer rather than on the vocabulary of the index. Again in this article, the authors confirm that:

> "Given the same vocabulary, any two systems should be capable of operating at about the same level of efficiency; any discrepancy in their performance due to actual file arrangement is not likely to make more than a one percent difference to either recall or relevance figures for the system...This refers to index performance, not over-all economic efficiency. The latter must consider further factors, such as ease and convenience (to librarian and user) of assembling, maintaining and operating a system."(13)

The Cranfield Project is now engaged in research on index language devices to determine their precise impact on recall and and relevance - devices such as role indicators, coordination of terms, and weighting of terms which the investigators feel improve relevance and reduce recall, and devices such as multiple hierarchical linkage and synonym control which they believe improve recall and reduce relevance. It will be interesting if the Cranfield staff next undertakes another trully comparative study to test the efficiency of the four original systems: alphabetical subject, Universal Decimal Classification, facet classification and coordinate indexing, in the light of what they have learned from the previous studies.

Another kind of deep indexing should be mentioned briefly, even though it is not subject indexing - the new Science Citation Index. This index, and let's forget about the cost and the atrocious, hardly legible print, gives approximately one and a quarter million cited references for just the year 1961. Its arrangement is alphabetical by author with no subject approach. Compound the number of references for a period of years, and I think it becomes self-evident that a subject approach becomes an absolute necessity. Any scientist who wishes to use the index is rarely interested in all of the citations to any article, but he is interested in those citations which pertain to his own specific interest, need and viewpoint at the particular moment he goes to the index. The tests of the Science Citation Index that will probably take place, the decisions arrived at, and the bases for these decisions should be meaningful to all of us involved in subject indexing. The Cleverdon studies have pertinence for indexing systems and here is an opportunity to put the findings of these studies to work in developing a new index.

We might also consider this paper in relation to depth indexing. In the first place, how deep an index would it have taken to pinpoint what to me are some of the myths in subject indexing? Here is where author's interest, need and viewpoint are of significance. Could I, or indeed should I, have expected any index to gather together for me just those documents which I finally decided were important for this paper? No index, however exhaustive, could have led me directly to only those publications

that I finally selected. Depth indexing could have either made me miss something I wanted, or could have drowned me in the prolific flood of library literature.

Let's turn to the other side of the coin. When this paper is published suppose some library or information center which uses a deep indexing system incorporates the paper into its collection. I have mentioned the National Agricultural Library, coordinate indexing, faceted classification, and colon classification. Surely each of these would have to be brought out in the deep indexing system. Fine, so far. But what happens when some earnest body wants a history of the National Agricultural Library, or an explanation of faceted classification, colon classification, or coordinate indexing? The deep indexing leads him to this paper, which upon examination, turns out to be just a lot of "noise" from that poor user's viewpoint.

Thus from either viewpoint, mine when gathering background readings for this paper, or someone in need of specific information after the paper has been published, deep indexing fails to meet the needs. In writing about classification systems, Ralph Shaw made a statement that I believe is as applicable to subject indexing as it is to classification systems:

"Our needs differ from situation to situation and from task to task as well as from person to person and from place to place."(14)

Whether we are pure acientists, social scientists, documentalists, engineers, librarians, or what have you, deep indexing and exhaustivity cannot give to us quickly and easily everything we need, at the time we need it, from the exact viewpoint we need it - in other words, it cannot be all things to all people. I question whether it can be all things to some people. I'll go a step further. Should we expect any indexing system to meet every demand made by every inquirer? My answer is No! But we should expect our own indexing system, along with the important published tools from other systems, to meet the needs of our own users.

Subject Heading Lists

Another myth is that a universal subject heading list can be developed, or if not, that individual subject heading lists, each devoted to a different discipline, can be made completely compatible, giving us in effect a universal list. Efforts are being made now to determine the validity of this. I shall go into that a little more in a moment, but first I want to digress to bring up the myth that subject headings needed to catalog a book are different from subject headings needed to index a periodical article.

Is this a myth? I believe it may be. In the preliminary edition of the <u>Subject Heading List</u> of our Library, published in 1963, I have listed a number of projects which we wish to study. Among these is:

> "Study the subject headings currently used in the <u>Bibliography of Agriculture</u> to determine the feasibility of producing a combined, revised list of subject headings to serve the needs of agricultural card catalogs and published bibliographies, whether produced manually or by machine."(15)

As a part of the project we want to find the best arrangement for the revised edition: Alphabetical as it is now, categorized, or both? Although we have been eager to go to work on this project, for a number of reasons we have been unable to proceed.

The National Library of Medicine adopted a single subject authority list for cataloging books and indexing periodical articles in 1960 when the first edition of <u>Medical Subject Headings</u>(16) (popularly known as (MeSH) was published. This list was a tightly controlled alphabetical list. The Preface to the 2d edition of MeSH published in January 1963 states:

> "We are convinced of the value of using an identical authority list for the indexing of periodicals and the cataloging of books."(17)

For the first time, a categorized list of subject headings appears as an appendix in the second edition. The 3d edition of <u>Medical Subject Headings</u> published in January 1964(18) reaffirms the use of a single subject heading list for periodical indexing and book cataloging. The list is still tightly controlled and in alphabetic arrangement, with an appendix which categorizes the subject headings. It is my understanding that due to MEDLARS, it is expected that the list of subject headings may be greatly expanded. If this is done, I am eager to learn what will happen to the categorized appendix.

Another example of a single subject authority list for cataloging books and indexing periodicals is the <u>Thesaurus of Descriptors</u> developed under the guidance of Dr. Jack Hilf, and recently issued by the Bureau of Reclamation.(19) The main part of this list is made up of an alphabetical list of descriptors, followed by a list of 47 descriptor groups which include each descriptor, and this in turn is followed by a list of broad descriptor fields which include each descriptor group. The system is used to index documents for the Bureau's selective dissemination system, for its quarterly abstract bulletin, and for the Library accession list. It is also used to index the interest profiles of selective dissemination recipients and to develop a printed index which supplements the catalog cards for subject retrieval of library documents. It is just now beginning to be used for library cataloging pruposes.

Traditionally, lists of subject headings are alphabetical, and different lists have been used for book cataloging and for periodical indexing. The reasons given include new ideas which do not have a preferred terminology yet, and more specific indexing is required for periodical articles since they deal with more specific subjects. I wonder if this is necessarily so. Can a single list be used for multiple disciplines by laying down rules for its use? Are categorized lists important enough to warrant the time and effort it takes to prepare them? In a large list, such as that of the National Agricultural Library which includes over 90,000 entries, can the terms be uniquely categorized, or should they be? Questions such as these must be answered to prove or disprove whether separate lists are needed for periodical indexing and for book cataloging.

Now to return to the subject of the universal subject heading list. A survey of current thinking makes it fairly evident that this is considered a non-attainable goal, and furthermore, that it is doubtful if this should even be a goal. But there is definite interest in the possibility of making different subject heading or indexing lists compatible with each other. A case in point is the interest of the Committee on Scientific Information of the Federal Council for Science and Technology which has generated and followed closely studies and developments in this area.

A recent Datatrol Corporation study concentrated on how a common vocabulary might be involved in the announcement, distribution and indexing of open government research reports when the nature of the reports remained the same, the interests of the various agencies remained the same, and the agencies retained their own techniques for indexing the literature. This study was devoted to subject heading lists of agencies dealing with and interested in the same subjects; the agencies involved were the Defense Documentation Center, the National Aeronautics and Space Authority, the Atomic Energy Commission, and the Office of Technical Services. Let us look at some of the conclusions reached in this report:

1. "Neither a single thesaurus, a single subject heading list, nor correlated thesauri, offers any significant advantage over current vocabulary displays of the operating agencies for announcement or for 'simultaneous searches of multiple collections.'

2. "Where the interests of different agencies coincide or overlap, their indexing of common subject matter will be recognizably similar and there will be little difficulty in converting one vocabulary to another for information retrieval - by machine or manually.

3. "Where the interests of different agencies do not coincide, their indexing will be dissimilar, regardless of the vocabulary available.

4. "Even in agencies where the avowed policy is to use a rigidly controlled vocabulary, indexers will vary considerably in their selection of indexing terms to describe the document content.

5. "A common subsumption scheme superimposed on the indexing data of the different agencies would inject a significant degree of commonality among the announcement publications of the operating agencies. Such a scheme would also provide the base, or framework, for deriving indexing equivalents by computer for simultaneous searching of multiple collections."[20]

The lists examined were either subject heading lists or thesauri, and all of them used an alphabetic approach; three of the lists included category lists also. Even with interest in the same subjects by all of the agencies involved, development of a common subject heading list was not found to be practical or desirable because of differences in the broadness of coverage of the various agencies, the different viewpoints and depths of indexing of the various agencies, and the inconsistency in human indexing. But even so, a superimposition of broad subject categories is suggested for announcement purposes and to provide a framework for deriving indexing equivalents by computer for searching multiple collections.

Experience in a national library environment led me, at one point, to feel that a governmentwide alphabetical subject heading list should be developed. Since the subject heading lists of the three national libraries are alphabetically arranged, and since between them they pretty well cover the entire field of knowledge, I thought it might be practical to publish one subject heading list which would include the subject headings used by the Library of Congress, the National Library of Medicine, and the National Agricultural Library. This, it seemed to me, would give libraries and other bibliographical institutions an invaluable tool for indexing purposes. This monumental work would identify which headings were used by which of the libraries, and would point out where practices differ. It took just one short meeting with Library of Congress staff members to convince me that if such a work were produced, it would be exceedingly difficult to use, that special libraries prefer to use special lists, and that combining the lists would serve no useful purpose. Putting these lists together to produce one list would have been similar to combining automobiles and peaches to produce a pie. Whether the lists could be compatible with each other is another question.

CHALLENGE

I have spread the limits of the topic alphabetic subject indexing to discuss a few of what I call myths in the field of subject indexing. No doubt, each reader has other myths in mind, or quarrels with what I call myths. This is all to the good, for it points up the need for either exploding the myths or proving them to be facts. There is a continuing need for de-

fining our problems, for determining the basic causes of our problems, and for investigating various approaches to see if we can find solutions to our problems. Please note that I call for solutions in the plural. Much as I believe in uniformity and standardization for certain purposes, I do not believe that the same solutions should necessarily be applied to cope with the varying needs of our various situations. We live in exciting times when experimentation and research in the field of information storage and retrieval are recognized as vitally important not only within our own professions, but by the world at large. The challenge is with us now: To get and keep current with indexing the prolific flow of literature in order to supply what is needed, when it is needed, in the form it is needed, to the particular individual or group whom we serve. Through experimentation and research, without neglecting the alphabetical approach to subject indexing because of its familiarity, perhaps we can look forward to approaching Utopia which I define as: The happy marriage of research, sound judgment and indexing ability to the fruits of our modern technology, from which the offspring will be the solutions to our problems.

BIBLIOGRAPHY

(1) Mohrhardt, F. E. The flow of scientific information. Paper presented at the Annual Conference of the American Association of Agricultural College Editors, Stillwater, Oklahoma, July 10, 1963. p. 2.

(2) U. S. President's Science Advisory Committee. Science, Government, and Information. Washington, D. C., U. S. Govt. Print. Off., 1963.

(3) Cleverdon, C. W. ASLIB Cranfield Research Project. Report on the testing and analysis of an investigation into the comparative efficiency of indexing systems. Cranfield, October 1962.

(4) Indexing systems applied to a common sample. Scientific Information Notes. v. 5, no. 6, p. 9, Dec. 1963/Jan. 1964.

(5) Yerke, T. B. and Walker, C. M. The Oxford system: a study of its uses at a Forest Experiment Station. Journal of Forestry. v. 61, no. 4, p. 295-296, April 1963.

(6) Frarey, C. J. Subject headings. In Shaw, Ralph R., ed. The State of the Library Art. v. 1, pt. 2. New Brunswick, N. J., Graduate School of Library Service, Rutgers, the State University, 1960.

(7) Swanson, D. R. Dialogues with a catalog. Library Quarterly, v. 34, no. 1, p. 113-125, Jan. 1964.

(8) King, G. W. Automation and the Library of Congress. Washington, Library of Congress, 1963, p. 2, 11.

(9) Shaw, R. R. Information retrieval. <u>Science</u>, v. 140, no. 3567, p. 609, May 10, 1963.

(10) Aitchinson, J. and Cleverdon C. A report on a test of the index of metallurgical literature of Western Reserve University. Cranfield, College of Aeronautics, Oct. 1963. p. 60.

(11) <u>Ibid</u>. p. 60-61.

(12) Cleverdon, C. W., Lancaster, F. W., and Mills, J. Uncovering some facts of life in information retrieval. <u>Special Libraries</u>, v. 55, no. 2, p. 86-91, Feb. 1964.

(13) <u>Ibid</u>. p. 90.

(14) Shaw, R. R. Classification systems. <u>Library Resources and Technical Services</u>. v. 7, no. 1, p. 115, Winter 1963.

(15) U. S. National Agricultural Library. Subject heading list. Prelim. ed., v. 1, p. iii. Washington, U. S. Govt. Print. Off., 1963.

(16) U. S. National Library of Medicine. Medical subject headings. Washington, U. S. Dept. of Health, Education and Welfare, Public Health Service, 1960.

(17) U. S. National Library of Medicine. Medical subject headings. 2d ed. <u>Index Medicus</u>, v. 4, no. 1, pt. 2, Jan. 1963. p. ii.

(18) U. S. National Library of Medicine. Medical subject headings. 3d ed. <u>Index Medicus</u>, v. 5, no. 1, pt. 2, Jan. 1964.

(19) U. S. Bureau of Reclamation. Thesaurus of descriptors; keywords and cross-references for indexing and retrieving the literature of water resources development. Tentative ed. Denver, Col., 1963.

(20) Datatrol Corporation. Common vocabulary approaches for government scientific and technical information systems. Technical Report IR-10. [Silver Spring, Md.] Dec. 1963. p. 27-28.